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WEATHER AND CIRCULATION OF MARCH 1972

Hot and Dry in the Southwest

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1. MEAN CIRCULATION

As blocking retrograded into northeastern Asia during March 1972, intensifying storm systems moved across the Pacific Ocean on a depressed storm track from the Asiatic coastal trough to a deep, mean trough north of the Hawaiian Islands (figs. 1–4). To the east of the mid-Pacific trough, height anomalies increased in a strong mean ridge extending from the southeast Pacific to northwestern Canada. Although middle latitude portions of this ridge were near their February location (Taubensee 1972), there was retrogression at low latitudes and progression at high latitudes. The latter accompanied the development of a mean trough over Alaska in the wake of the retrograding high-latitude blocking ridge.

During the month, heights rose strongly over Canada (fig. 3), as the intense polar vortex that had dominated that area since December moved eastward. The trough to the south remained strong near the east coast of the continent in keeping with the amplified ridge upstream.

The Atlantic midlatitude westerlies built strongly northward during March (fig. 4) with the mean ridge remaining about stationary in the mid-Atlantic. In contrast to February when the main thrust of the Atlantic westerlies was toward Spain, the core of the 700-mb

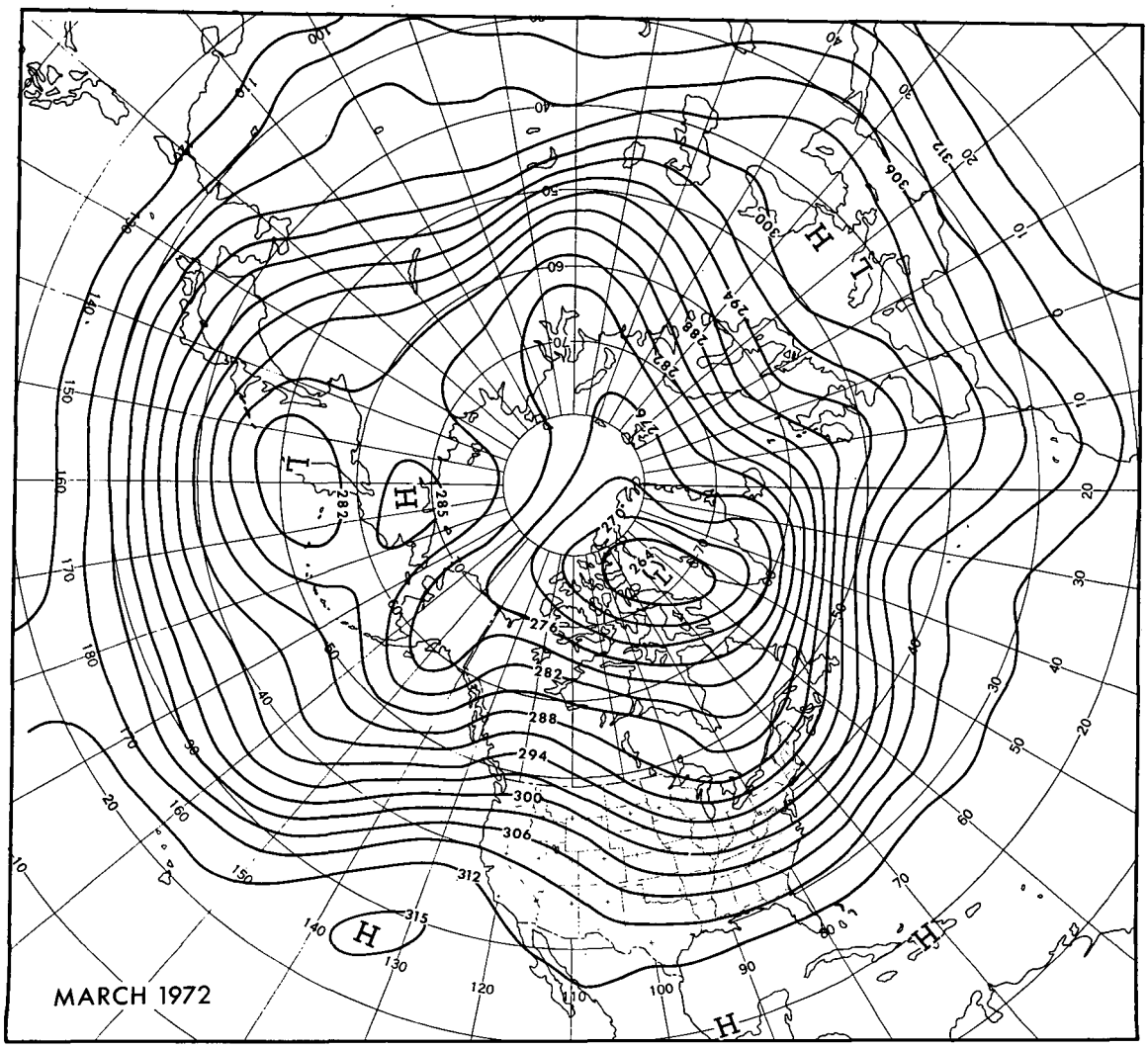


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for March 1972.

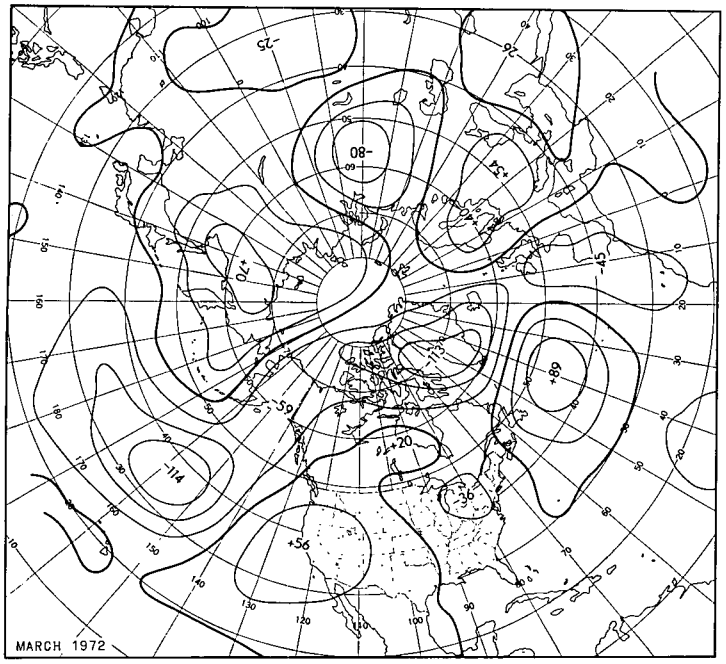


FIGURE 2.—Departure from normal of mean 700-mb height (m) for March 1972.

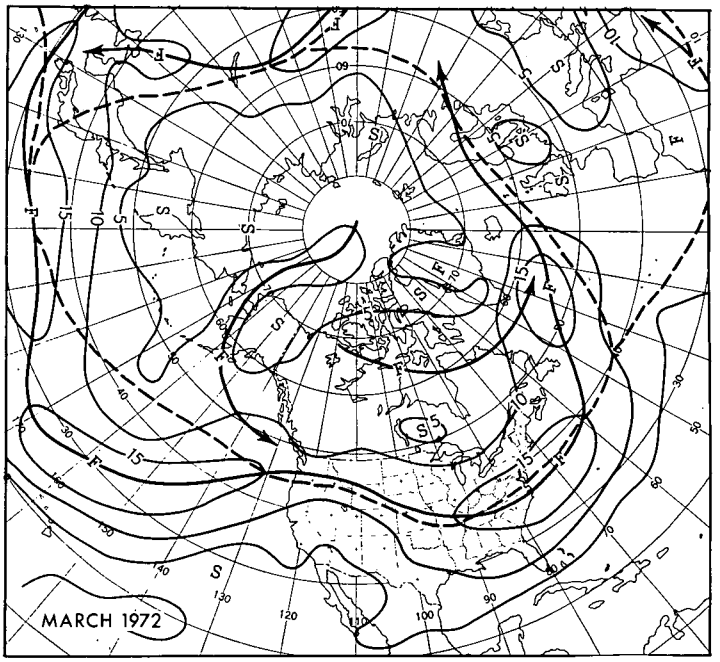


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for March 1972. Solid arrows show observed axes of maximum wind speed; dashed lines show the normal.

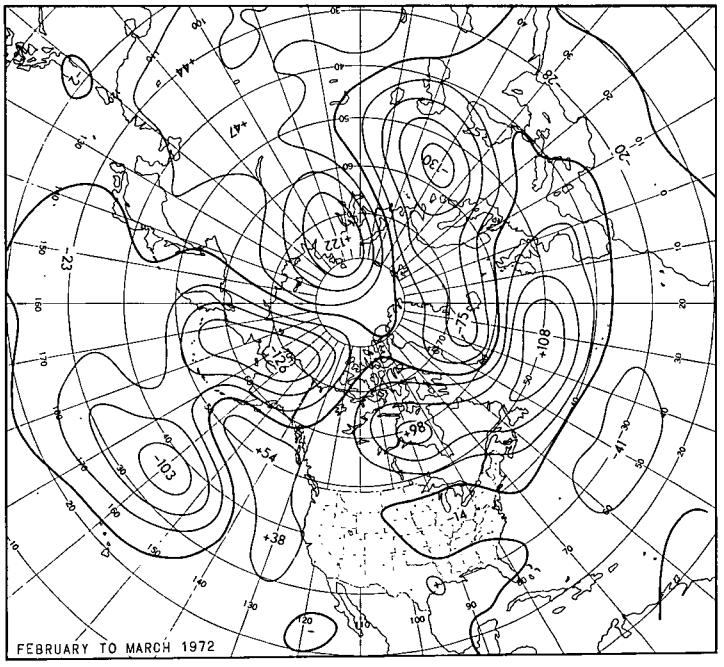


FIGURE 3.—Mean 700-mb height anomaly change (m) from February to March 1972.

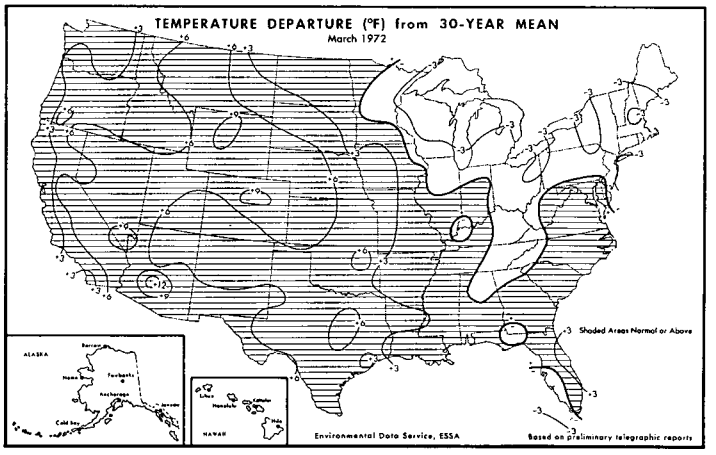


FIGURE 5.—Departure from normal of average surface temperature (°F) for March 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

westerlies in March was north of Great Britain. This change was accompanied by falling height anomalies in the vicinity of the Scandinavian mean ridge and a flattening of the west Asia trough (fig. 3). A moderately deep upper trough persisted along the coast of Spain and northwest Africa to the east of the amplified Atlantic mean ridge.

2. TEMPERATURE

Mean temperatures were well above normal over the western half of the Nation during March (fig. 5) under the influence of a building upper level ridge and associated above-normal heights (figs. 1–3). From California to the Rocky Mountains and northward to Wyoming, this March was one of the warmest of record. New daily record high temperatures were observed on 15 of the first 19 days of March at Albuquerque, N. Mex., on 14 of the first 25 days at Ely, Nev., and on 9 days at Phoenix, Ariz.

In the contiguous United States, below-normal temperatures were confined to the northeastern quarter of the Nation. This was the only area consistently affected by polar Highs moving across Canada. The dearth of polar Highs in mid-Nation was related to the weaker than normal northerly wind components at 700 mb over northwest Canada during the month (fig. 2). Greatest negative departures of temperature this March were over Alaska

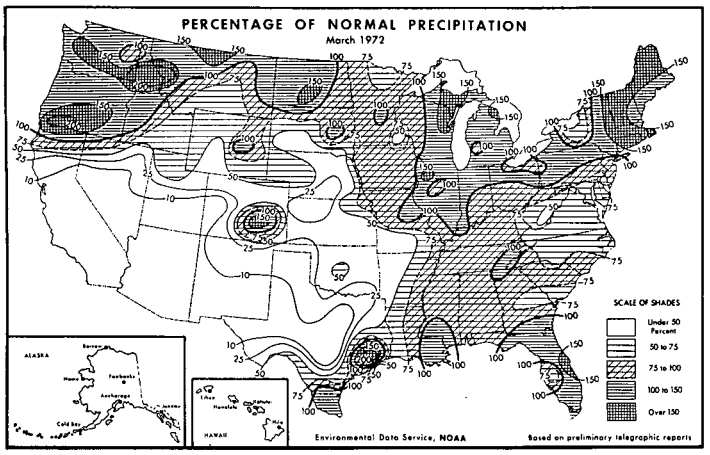


FIGURE 6.—Percentage of normal precipitation for March 1972 (from Environmental Data Service and Statistical Reporting Service 1972).

TABLE 1.—*Locations having record low January through March precipitation in 1972*

Location	Amount (in.)
Phoenix, Ariz.	0
Winslow, Ariz.	0
Yuma, Ariz.	0
Tucson, Ariz.	0. 01
Milford, Utah	0. 05
Los Angeles, Calif.	0. 13
San Diego, Calif	0. 17
Grand Junction, Colo.	0. 22
Stockton, Calif.	1. 46
Sacramento, Calif.	2. 59

in response to the strong northerly flow and deep trough observed there (figs. 1, 2). King Salmon, Alaska, experienced a record cold March with a monthly mean temperature of 1.8°F, 17.7° below normal.

3. PRECIPITATION

The most important precipitation anomaly during March was the extreme dryness over much of the Southwest (fig. 6). Many stations received no precipitation at all. The strong mean ridge over the west (figs. 1, 2) effectively excluded storm systems from a normal March track out of the Great Basin (Klein 1957), as was the case during February (Taubensee 1972). This was the third consecutive dry month in the Southwest; several locations have reported the driest January–March period of record (table 1). The dry area during March also extended over most of the Southern and Central Great Plains, where northerly wind components were stronger than normal at 700 mb.

The Pacific Northwest, under the influence of moderately strong upper westerlies (figs. 1, 4), received above-normal precipitation. A substantial proportion of the air masses affecting this region originated over the Pacific south of normal origin (figs. 1, 2, 4) and traversed a sizable area of anomalously warm surface water (National Marine Fisheries Service 1972). This too probably had an impact upon precipitation yield. Above-normal precipitation also occurred in parts of the Northern Great Plains and from the Great Lakes to New England in connection with storms traveling near the 700-mb wind speed maximum. Some of these storms moved very slowly in the latter region, immediately south of the incipient Canadian block (figs. 1, 2). Above-normal precipitation along the gulf coast and over Florida occurred largely in connection with cold frontal passages and with storms late in the month following a depressed track.

With arctic air masses dominating Alaska during March, precipitation was subnormal over most of the State. Above-normal totals were generally limited to regions east of the strong Gulf of Alaska trough (figs. 1, 2).

The deep trough north of the Hawaiian Islands (figs. 1, 2) was associated with weak trade winds over the Islands. At Hilo, this led to record-low March precipitation, 0.88 in., 13.82 in. below normal.

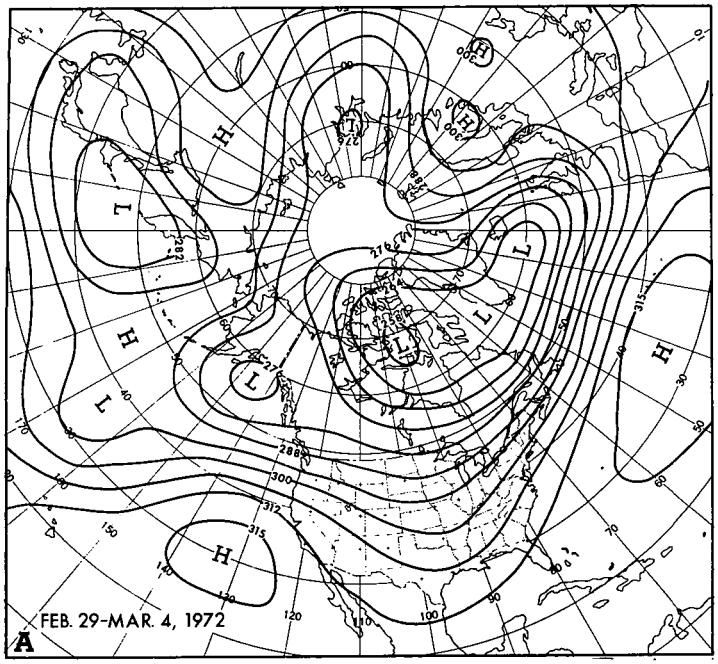
4. VARIABILITY WITHIN THE MONTH

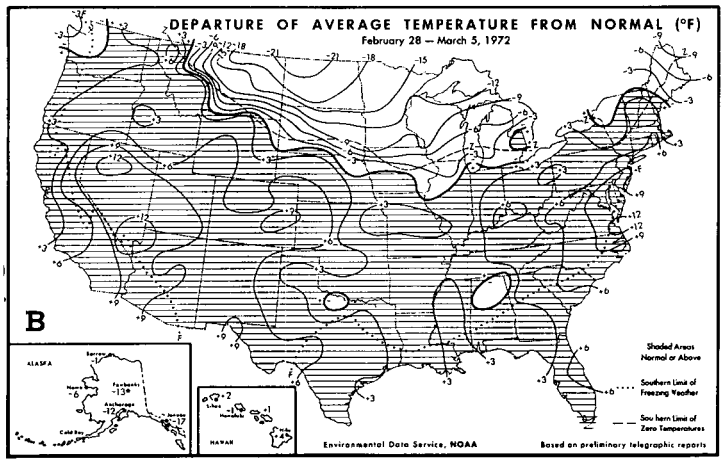
Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb maps are shown in figures 7–11.

Early in March (figs. 7, 8), the midtropospheric circulation closely resembled the mean of the previous month (Taubensee 1972). Prominent features included blocking ridges over northeastern Siberia and Scandinavia, a strong cyclonic vortex over northern Canada, strong, depressed Pacific westerlies, and strong Atlantic westerlies that were moving northward.

During the remainder of the month (figs. 9–11), however, the circulation underwent a rapid transition to a radically different regime. Early signs of change were the retrogression, weakening, and merging into the westerlies of the North Pacific block, as well as the erosion of northern portions of the Scandinavian block (fig. 9). With the removal of these impeding features, the high-latitude wave train became progressive in most areas (fig. 10). During this period, troughs progressed to Kamchatka, the Gulf of Alaska, Greenland, and Scandinavia, and an amplified ridge that earlier had built over northwestern North America moved to Hudson Bay. Wave progression at high latitudes only led to phase separation between high and low latitudes over much of the hemisphere (figs. 10, 11). By the end of the month (fig. 11), a trough had formed in the Mississippi Valley and a rather typical blocking pattern prevailed over North America. Major developments elsewhere at the end of the month included a strongly amplifying ridge over the Taymyr Peninsula where a mean trough had prevailed, and formation of a Low north of Hawaii in a trough largely by-passed by the westerlies.

Early in the month (fig. 7), fast westerly flow along the northern border of the United States largely contained the cold air over Canada. Incursions of cold air were limited to the north-central States and record highest temperatures for so early in the season were observed in Nevada, Arizona, and New Mexico as well as at some locations along the East Coast from North Carolina to Maine.





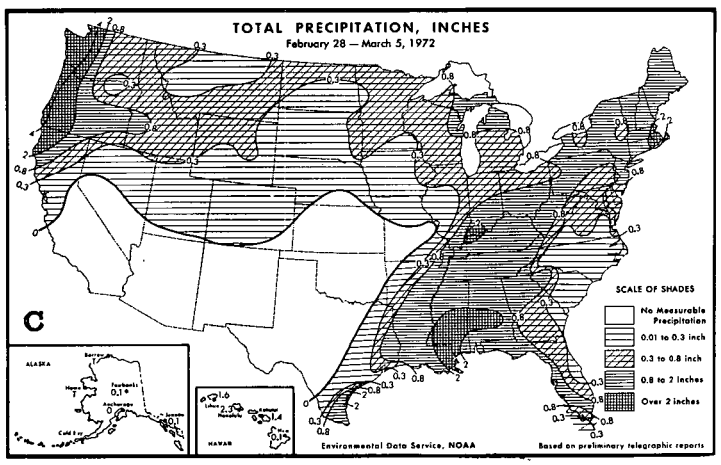
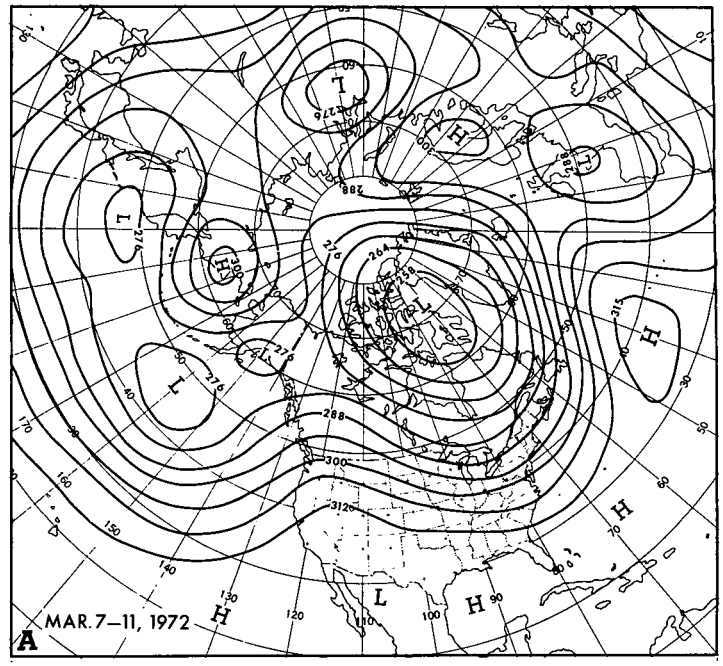
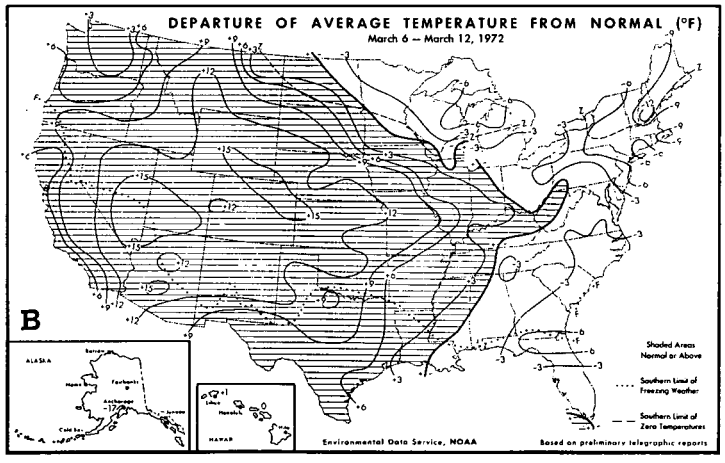


FIGURE 7.—(A) mean 700-mb contours (dam) for Feb. 29–Mar. 4, 1972; (B) departure of average surface temperature from normal (°F) and (C) total precipitation (in.) for week of Feb. 28–Mar. 5, 1972 (from Environmental Data Service and Statistical Reporting Service 1972).





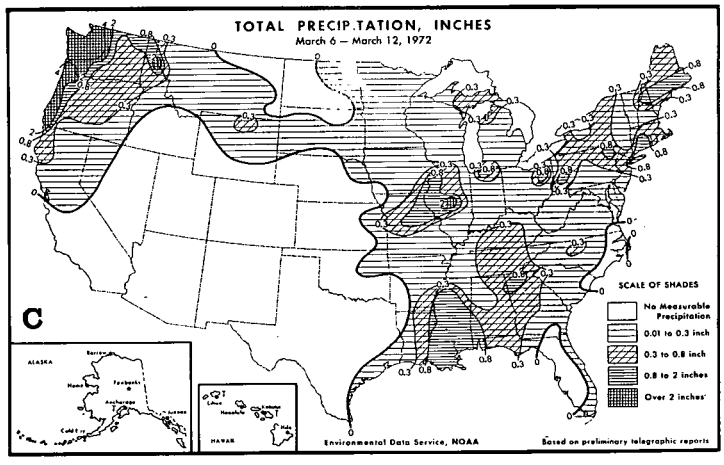
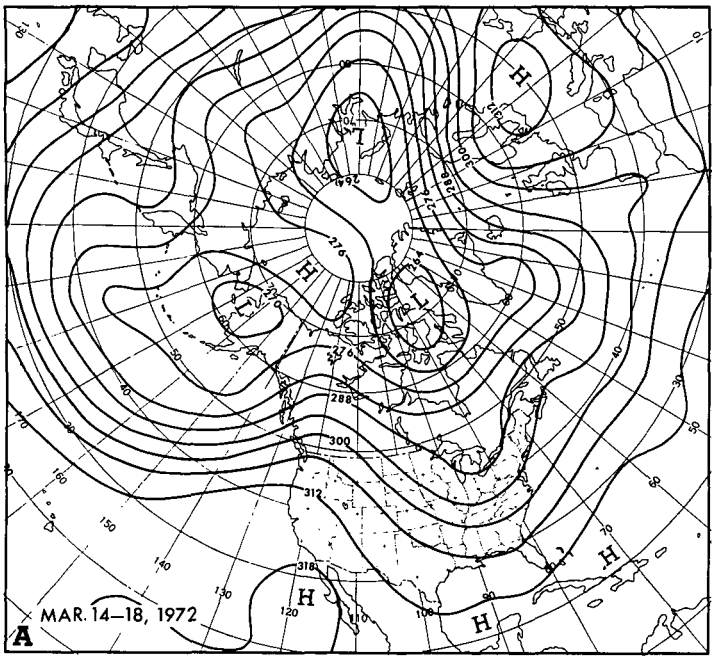
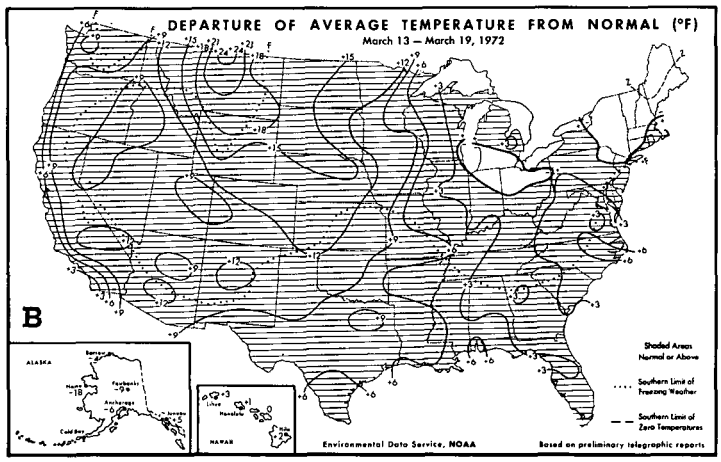


FIGURE 8.—Same as figure 7, (A) for Mar. 7–11, 1972; (B) and (C) for week of Mar. 6–12, 1972.

As the wave pattern over North America amplified and progressed (fig. 8), cold air covered the eastern seaboard and the Great Lakes region. With subsequent flattening of the flow over Canada, however, the cold advection into the United States was quite limited (fig. 9). Between March 6 and 19, numerous record high temperatures for so early in the season were observed in the West and also in the Central Great Plains. With the inception of blocking over North America (fig. 10), temperatures dropped sharply over much of the eastern third of the Nation. At Greensboro, N.C., the 12°F observed on March 26 was





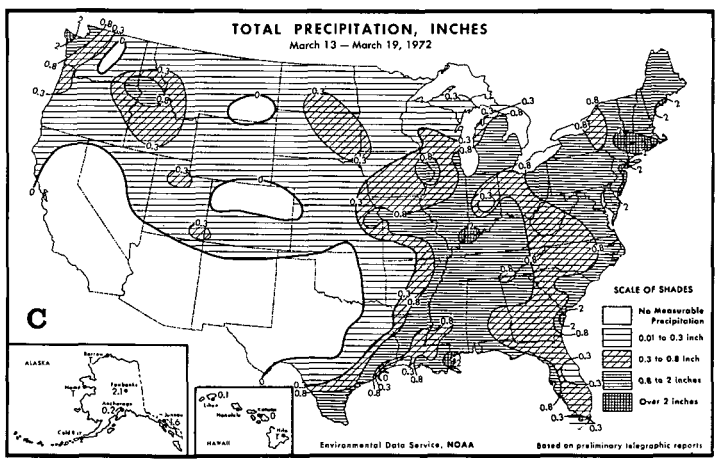
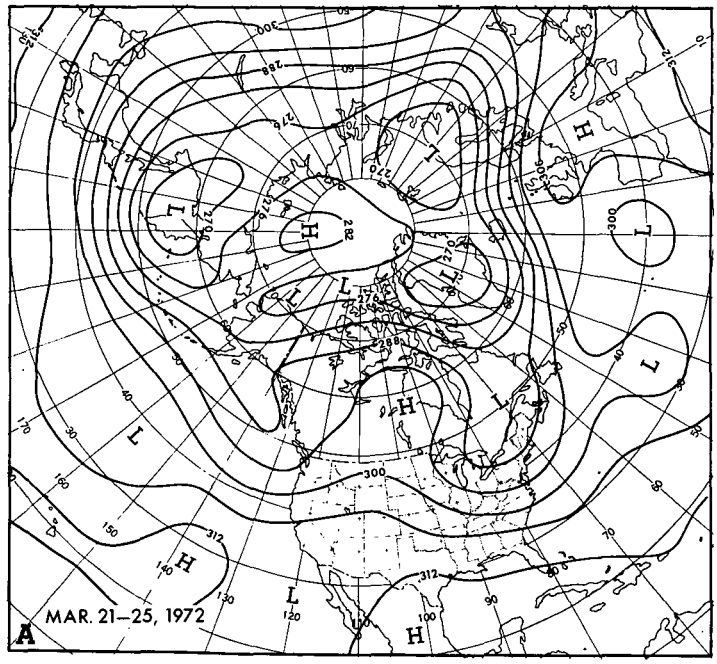
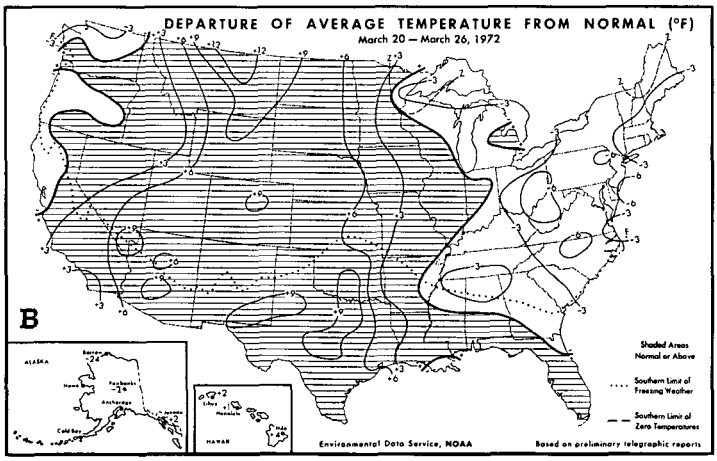


FIGURE 9.—Same as figure 7, (A) for Mar. 14–18, 1972; (B) and (C) for week of Mar. 13–19, 1972.





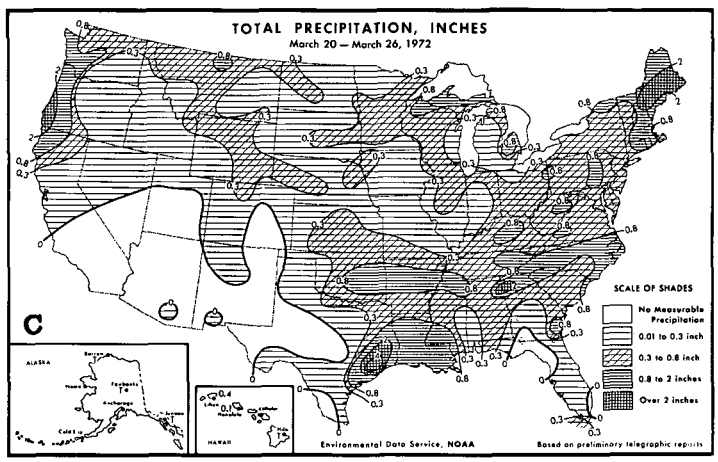
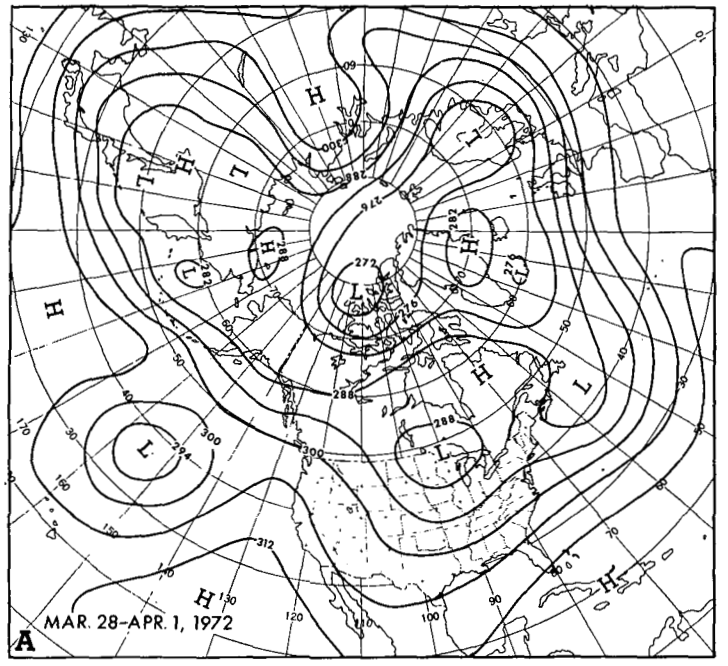
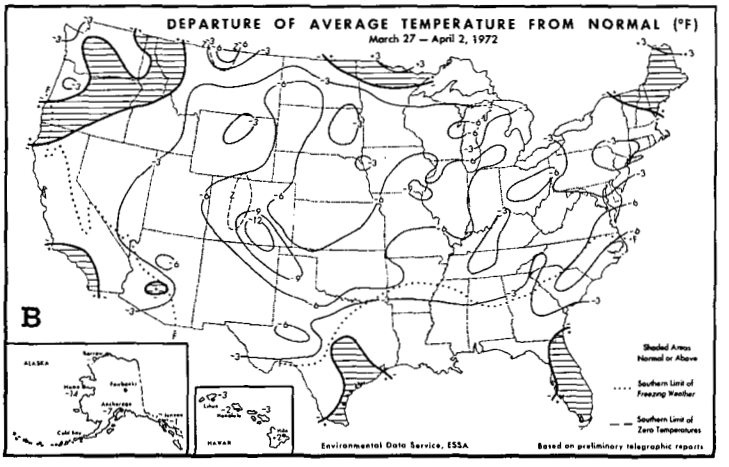


FIGURE 10.—Same as figure 7, (A) for Mar. 21–25, 1972; (B) and (C) for week of Mar. 20–26, 1972.

a record low temperature for so late in the season. Development of the midlatitude west coast trough during this period also brought marked cooling to the Pacific Northwest.

By the end of the month (fig. 11), temperatures were below normal over most of the Nation in response to the strongly blocked flow pattern and the building ridge off the west coast. Freezing temperatures during this week, following 6 weeks of above-normal temperatures, severely damaged western orchards from Washington and California across the Rocky Mountains to northern Texas and Oklahoma (Environmental Data Service and Statistical Reporting Service 1972).





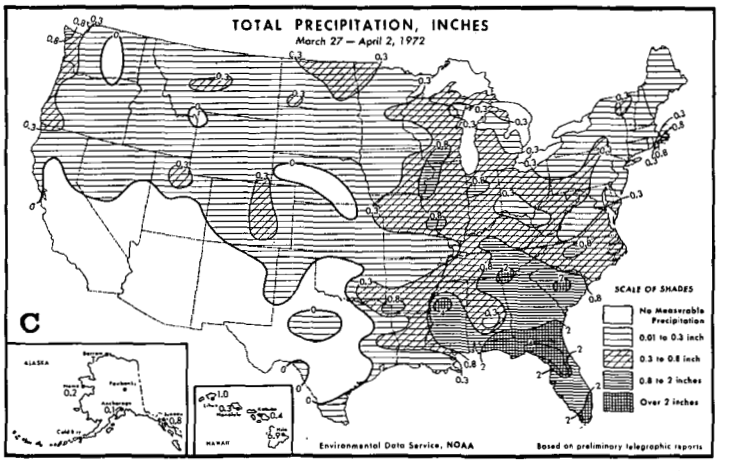


FIGURE 11.—Same as figure 7, (A) for Mar. 28–Apr. 1, 1972; (B). and (C) for week of Mar. 27–Apr. 2, 1972.

Precipitation in the Pacific Northwest was greatest early in the month (fig. 7) and during the week of March 20–26 (fig. 10) when westerly wind components along the coast were strongest. These two periods also were the greatest precipitation producers over the northern Rocky Mountains and in north-central parts of the Nation as storms embedded in the westerlies traversed that area. Precipitation occurred weekly over most of the eastern half of the Nation as a mean trough prevailed there. The Southwest remained dry during the entire month as a mean ridge (figs. 8–10) or northwesterly flow (figs. 1, 11) dominated the area. Under the influence of Canadian blocking with depressed westerlies over the United States late in the month (figs. 10, 11), precipitation became more widespread, but still avoided the dry Southwest.

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